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EFFECT OF 6-DAY HYPOKINESIA ON OXYGEN METABOLISM
INDICES IN ELDERLY AND SENILE SUBJECTS

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16. Abstract After a strict 6-day confinement to bed of elderly and senile subjects the oxygen supply of the subcutaneous cellular tissue was impaired, and the intensity of its tissue respiration was somewhat reduced. The vacat-oxygen of the blood and urine, the coefficient of incomplete oxidation, and the oxygen deficiency in the organism were increased.					
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EFFECT OF 6-DAY HYPOKINESIA ON OXYGEN METABOLISM INDICES IN ELDERLY AND SENILE SUBJECTS

L. A. Ivanov and P. A. Orlov

After a strict 6-day confinement to bed of elderly and senile subjects the oxygen supply of the subcutaneous cellular tissue was impaired, and the intensity of its tissue respiration was somewhat reduced. The vacat-oxygen of the blood and urine, the coefficient of incomplete oxidation, and the oxygen deficiency in the organism were increased. /35*

Hypokinesia is a significant factor in premature aging [5, 7, 9, 10]. Due to the role of oxygen deficiency in the development of senile shifts [4, 6, 8] of especial importance is the study of the hypodynamic effects on the oxygen metabolism indices and the oxidation-reduction processes in elderly and senile people.

This work studied the effect of hypokinesia on the oxygen absorption, its stress in the tissue, and the content of incompletely oxidized products in the organism of elderly and senile people. /36

Technique

Oxygen stress (PO_2) was determined in the subcutaneous cellular tissue of the left forearm by the polarographic method. The active cathode was an exposed platinum needle electrode 0.4 mm in diameter, while the comparison anode--silver chloride electrode superimposed on the distal third of the right shin. Measurements were made with a supply of constant voltage 0.7 v to the

*Numbers in the margin indicate pagination in the orginial foreign text.

electrodes. Graphic recording was made with the help of an automatic electron potentiometer EPP-09MZ through a photocompensation amplifier F 116/1. The results were expressed in millimeters of a mercury column by conducting electrode calibration after each study in physiological solutions with a certain oxygen pressure.

As functional tests permitting an evaluation of the oxygen supply to the subcutaneous cellular tissue and the intensity of its oxygen consumption 10-minute oxygen inhalation and pinching of the vessels in the limb for 10 minutes were used. A spiograph SG-1m was employed to measure out and record the oxygen load. Spirographic study also made it possible to determine oxygen absorption and its deficiency in the organism [3].

The content of incompletely oxidized products in the blood was determined according to Roman's method with correction for sugar according to Hagedorn-Iensen, and with correction for chlorides according to Levinson. The vacat-oxygen of the urine was determined by the Brin micromethod with correction for chlorides according to More, and the protein-free nitrogen of the urine--K'yel'dal's semimicromethod.

Twenty-one essentially healthy men were examined of elderly (60-74) and senile (75-89) age before and after a strict 6-day confinement to bed.

Results

After a course of strict confinement to bed for elderly and senile people the increase in PO_2 in the subcutaneous cellular tissue during oxygen inhalation was reduced from 38.2 ± 4.69 to 24.4 ± 3.21 mm Hg ($D < 0.02$), which reflects the exacerbation of the oxygen supply to the subcutaneous cellular tissue. There was a certain tendency for the latent period in the reduction of PO_2 in the subcutaneous cellular tissue to be lengthened in the transition from oxygen inhalation to air respiration (41.6 ± 4.24 sec. as compared to 34.4 ± 4.12 sec. before hypokinesia; $0.2 < D < 0.3$), as well as in the test with vessel constriction (11.9 ± 1.55 sec. as compared to 8.6 ± 0.92 sec.;

$$0.05 \leq D \leq 0.1).$$

The indicated parameters reflect the intensity of tissue respiration, and they increase with its reduction [2]. The reality of the noted trend towards reduction in oxygen consumption of the subcutaneous cellular tissue after hypokinesia is confirmed by the fact that despite the significant drop in PO_2 increase during oxygen inhalation under these conditions, the length of stabilization of the PO_2 level during the transition from oxygen respiration to air respiration essentially was not altered (respectively 483.6 ± 31.92 and 473.2 ± 27.39 sec.). In addition, despite the exacerbation in the oxygen supply to the subcutaneous cellular tissue, the amount of PO_2 in this tissue in the elderly and senile subjects after hypokinesia was practically preserved at the initial level (48.6 ± 2.62 mm Hg).

After the hypokinesia course oxygen absorption in the elderly and senile subjects did not change (214.2 ± 20.12 ml/min with initial 228.9 ± 8.54 ml/min).

EFFECT OF HYPOKINESIA ON OXIDATION-REDUCTION PROCESSES INDICES
IN ELDERLY AND SENILE SUBJECTS ($M \pm m$)

Index	Before hypokinesia	After hypokinesia	D
Vacat-oxygen of diurnal urine (in g)	9.08 ± 0.91	11.5 ± 0.52	< 0.05
Coefficient of incomplete oxidation	1.14 ± 0.034	1.36 ± 0.059	< 0.001
Vacat-oxygen of blood (in mg%)	233 ± 9.08	270 ± 9.71	0.01

In individuals of elderly and senile age after a 6-day bed confinement the level of vacat-oxygen increased in the blood and diurnal urine, and the coefficient of incomplete oxidation was augmented (see the table). The reliable increase in concentration of incompletely oxidized products in the blood and urine reflects the exacerbation in the oxidation-reduction processes under conditions of hypokinesia, which results in a less complete oxidation of the metabolites. An increase in the coefficient of incomplete oxidation indicates that the oxidation reactions are less complete.

As is known, excess oxygen absorption from hyperoxic mixtures as compared to oxygen absorption during air respiration ("oxygen deficit") is

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governed by an accumulation of metabolites in the organism whose oxidation consumes an additional quantity of oxygen [1, 11]. This is why an increase in the "oxygen deficit" in the organism that is detected in elderly and senile people after a 6-day hypokinesia ($24.8 \pm 3.76\%$ versus $12.2 \pm 1.33\%$; $D < 0.003$) can be explained by the increase in the level of incompletely oxidized products detected under such conditions.

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